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Paleobiological Significance of Trichome Inclusions in Baltic Amber from Goa, India

Sujata Dabolkar* and Nandkumar M. Kamat

Mycological Laboratory, School of Biological Sciences and Biotechnology, Goa University, Taleigao -403206(GA), India

*(*Corresponding author E-mail: sujatadabolkar@gmail.com; ORCID ID: https://orcid.org/0000-0001-6141-3069)*

Abstract

Baltic amber (succinate) is a fossilized resin belonging to the Eocene period (44-49 million years old) derived from the Araucariaceae and Leguminosae families of trees containing up to 8% of succinic acid and compounds such as terpenoids and phenolic derivatives. Amber is primarily yellow in colour, having different shades ranging from light yellow to dark yellow to brown to black. This is the first report on the trichome bioinclusions from imported Baltic amber in Goa. Samples of imported Baltic amber were validated and studied for the presence of bioinclusions. Trichomes, also known as "stellate hairs," are present in the vast majority of angiosperms and are considered for some time to be of importance in comparative systematic studies. Trichomes have an important role as a defensive structure for plants. The trichomes are common in Baltic amber and have been considered as a characteristic of this type of amber. Higher flow of tourists from Russia to Goa by chartered flights has introduced many traded commodities like semi-precious stones and Baltic amber. Since amber of this quality was not easily available in India, the Baltic amber traded in Goa was utilized for scientific studies focused on the identification of biological inclusions after sorting and classifying the purchased samples from authentic traders. This paper reports preliminary analysis of fossilized trichome elements in locally purchased samples of Baltic amber imported from Russia. Specimens were subjected to stereomicroscopic and phase contrast microscopic analysis, and interesting inclusions entombed in amber were studied. Two types of trichomes were found to be present in the Baltic amber stellate hair type and glandular types. The stellate hair type of trichomes was minute and radially branched, ranging from 12 to 17 radii. Glandular trichomes were erect, with a unicellular glandular head and possessed a stalk which was both unicellular and multicellular.

Keywords: Baltic amber, Fossils, Trichome, Bioinclusions, Goa, India

Introduction

Amber (Succinate=$C_6H_6O_4$) is the fossilized resin produced from the trunks and the roots of certain trees, mainly belonging to the family Pinaceae. The plant that secreted Baltic amber has already been identified as *Pinites succinifer*. Amber is a complex mixture of diverse compounds, such as terpenoids and phenolic derivatives (Poinar, 1992) is found distributed globally in Russia, France, Germany, Lebanon, Spain, Dominican Republic, Austria, USA, Myanmar, Japan, and Mexico (Schmidt *et al*., 2014). The age of all amber specimens has been determined to be minimum 4 to maximum 300 million years old. Amber primarily yellow in colour displays shades ranging from light yellow to dark yellow to brown to black (Aranda *et al*., 2007). Nathanael Sendel (1686 - 1757) is a pioneer in research on plants, microbes, and animals embedded in Baltic amber. Plants secrete resin when they suffer injury, and the biota, such as microbes, plant parts and animals get trapped inside this resin. Over the years, the process of fossilization occurs, and resin is converted into amber, and the bioinclusions remain inside the amber (Pontin and Celi, 2000). Organisms that were trapped in resin and are preserved in amber are called bioinclusions, and some of these are especially informative about various taphonomic processes, paleoenvironmental conditions, and important paleobiological aspects (Speranza *et al*., 2015). Amber has been used since prehistory in the manufacture of jewellery and ornaments. The scent of amber and amber perfumery is well known. Amber oil has been used for medicinal purposes (Poinar, 1992). Differences between "true/ natural/ biogenic" and false/ synthetic/ artificial amber can be identified by some classical tests, for example, true amber produces sweet, pine smell when burnt and does not dissolve in acetone (Pionar, 1992). True amber floats in salt water, and this is called as saltwater test (Raducanu, 2006). Amber burns with a black smoke like incense and does not melt and this forms the basis of the validation of amber by the burning test

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